

DISCOVERY

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Author Affiliation:

¹Associate Professor, Dept. of Kriya Sarira, MVR Ayurveda Medical College, Parassinikkadav, Kerala, India

²Deputy Physician, Clinical research, Arya Vaidyasala Kottakkal, Kerala, India

³Assistant professor, Dept. Of Kaumarabhrithya, MVR Ayurveda Medical college, Parassinikkadav, Kerala, India

⁴Assistant Professor, Dept. of Samhita and Siddhanta, MVR Ayurveda Medical college, Parassinikkadav, Kerala, India

Contact List

Krishna Kumar V	drkrishnan83@gmail.com
Anoop AK	dranoopak86@gmail.com
Nithya AK	drnithyaak89@gmail.com
Visakh V	visakh.freekick@gmail.com

*Corresponding author

Associate Professor, Dept. of Kriya Sarira, MVR Ayurveda Medical College, Parassinikkadav, Kerala India
Email: drkrishnan83@gmail.com

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An intervention study to assess the effect of Surya anuloma viloma pranayama on Body Mass Index (BMI)

Krishna Kumar V^{1*}, Anoop AK², Nithya AK³, Visakh V⁴

ABSTRACT

Ayurveda, the science of life is being practiced in India for thousands of years is the world's first well organized health science that has sound scientific and philosophical basis. The scientific-spiritual discipline of yoga is an effective and time-tested method for improving our health as well as prevention and management of diseases. Obesity is a common but serious health problem in the present scenario. The prevalence of obesity is rising to epidemic proportions at an alarming rate in both developed and developing countries. In this intervention study it was observed that there was a strong effect of Surya anuloma viloma pranayama on body mass index. 2 groups A & B are randomly selected and group A practices both surya anuloma viloma pranayama and 2 yoga asanas (Vajrasana and pavanamuktasana). Group B practices only the mentioned yoga asanas. By doing surya anuloma viloma pranayama the breathing occurs only through the right nostril and only the pingala nadi is activated. The pingala nadi stimulation increases the sympathetic activity in the body which in turn increases the basal metabolic rate. On the basis of analysis, it was seen that the body mass index decreased in both the groups and the change in BMI is more significant in the group A; the group which was subjected to the surya anuloma viloma pranayama. The Change in respiratory rate was also significant and the respiratory rate increased in Group A and decreased in group B. In this study the added-on effect of surya anuloma viloma pranayama on BMI is compared with other conventional yoga asanas. The relevance of the study is that by this simple pranayama technique we can control our body weight even in the office room during the busy schedule.

Keywords: Surya anuloma-viloma pranayama, vajrasana, pavanamuktasana, pingala nadi

1. INTRODUCTION

Yoga is essentially a spiritual discipline based on an extremely subtle Science which focuses on bringing harmony between mind and body (Gangadhar and Varambally, 2011). Yoga is an art and science for healthy living. This is a very sane approach to yoga therapy and is true in case of the modern pandemic of

obesity (Wyatt et al., 2006) that is threatening the health and subsequently evens the wealth of the entire world. Early identification and classification of obesity is vital for managing the disorder and for effective prevention of the progressive complications. Yoga has significant role in managing obesity and prevent the complication that may arise from later. Everybody knows that the yoga asana can reduce the weight, but there is not much works to ensure that pranayama has an effect on body weight. The nasal cycle works on the basis of ultradian rhythm during which the patency and functional efficiency of the right and left nares changes alternately with an average periodicity of about 2-3 hours when awake (Keuning, 1964).

The connection of sympathetic and parasympathetic divisions of the autonomic nervous system and the nasal cycle has been worked out by experiments on humans. By doing nadishodhana pranayama, the breathing occurs through both nostrils, both ida and pingala nadi will be purified. In this both sympathetic system and para sympathetic system will work alternately (Dhanvijay et al., 2015). Right-nostril yoga breathing over a one -month period when practiced for 45 minutes increases oxygen consumption and causes sympathetic activation like an increase in peripheral vasoconstriction, increased systolic blood pressure and increased heart rate (Telles et al., 1994). This breathing may increase the sympathetic system and works on the metabolic activities and can reduce the weight. Forced breathing through the right nostril and occluding the left nostril was found to increase blood glucose levels and heart rate (Shannahoff-Khalsa, 2001) By considering all these, the present research work “An Intervention Study to Assess the Effect of Surya Anuloma Viloma Pranayama on Body Mass Index” has been selected.

2. METHODOLOGY

Objective

To assess the effect of surya anuloma viloma pranayama on body mass index.

Inclusion criteria

Overweight persons (BMI between 25-29.9) without systemic illness
Age between 25 and 45
Both sexes

Exclusion criteria

Individuals with history of systemic and mental illness
Individuals under medication
Alcoholics and smokers
Pregnant, menstruating & lactating women.
Individuals who are doing yoga & vigorous exercise regularly

Statistical Analysis

Diagrammatic representation of data, mean and standard deviation, two tailed t test.

3. OBSERVATION AND RESULTS

In the present study 60 individuals fulfilling the inclusion and exclusion criteria were randomly selected and divided in to two groups (A & B) of 30 individual each. Group A individuals were made to practice surya anuloma viloma pranayama and two yoga asanas (Vajrasana and Pavana muktasana) while group B individuals were made to practice two yoga asanas (Vajrasana and Pavana muktasana).

Observations were made before and after the procedure. As per the prepared proforma, observations were made regarding various socio demographic data such as age, sex, religion, educational status, dietary habits, types of profession etc. Ayurvedic parameters like prakriti, agni, jarana Sakthi, vyayama Sakthi are also observed. In the present study involving 60 individuals, there were distribution of 42% males and 58% females. In group A, it was 30% & 70% respectively, where as in group B it was 53% & 47% respectively. The vital parameters like respiratory rate, pulse rate, blood pressure, body weight and body mass index were observed before and after the intervention.

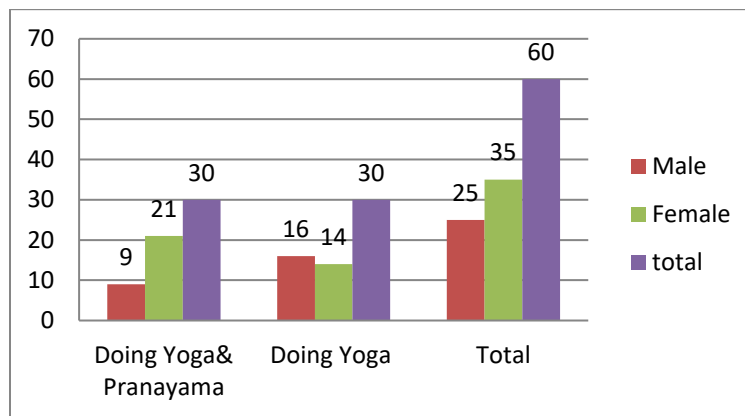


Figure 1 Distribution of Sex

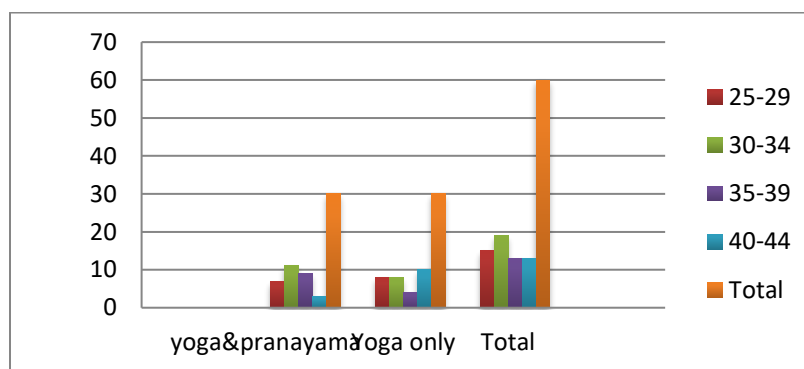


Figure 2 Distribution of Age

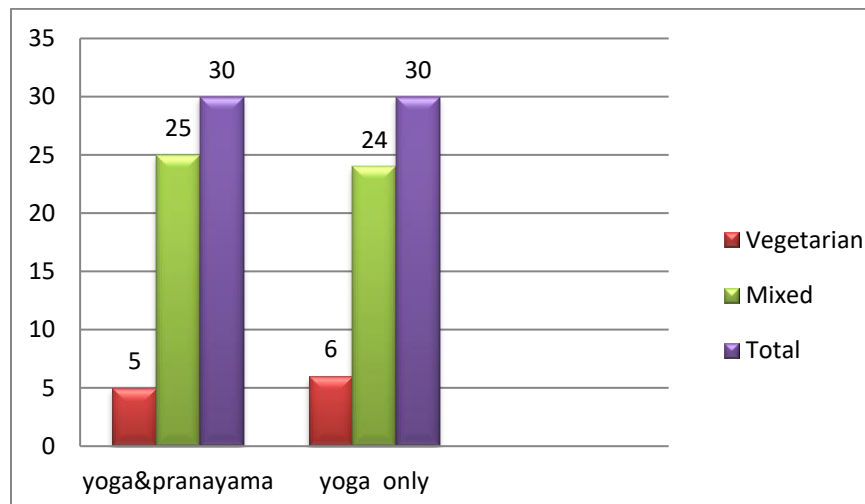


Figure 3 Distribution of Diet

Table 1 Change in Weight: Group A

Weight	Minimum	Maximum	Mean	SD
BT	65	86	71.13	5.90
AT	63	84	69.57	5.94

The mean weight before trail was 71.13 with SD of 5.90 and after trail the mean weight decreased to 69.57 with SD of 5.94.

Table 2 Change in Weight: Group B

Weight	Minimum	Maximum	Mean	SD
BT	64	86	72.37	6.67
AT	62	84.5	71.22	6.64

The mean weight before trail was 72.37 with S. D of 6.67 and after trail the mean weight decreased to 71.22 with S. D of 6.64

Table 3 Change in weight between two groups

Intervention	N	MD	SD	t	Sig.
Yoga	30	-1.15000	0.45	2.65411	0.01025*
Yoga & pranayama	30	-1.56667	0.72		

Two tailed t test, $\alpha=0.05$, *Significant at 95% confidence interval

The change in mean value of weight before and after trail in group doing yoga asana was -1.15000 with SD 0.45 and in the group doing pranayama with yoga was -1.56667 with SD 0.72. In group doing yoga only and group with yoga and pranayama the weight decreased. By conventional criteria the difference in body weight considered to be statistically significant with the p value 0.01025 which is less than 0.05.

Table 4 Change in BMI: Group A

BMI	Minimum	Maximum	Mean	SD
BT	26	29.9	27.59	1.16
AT	25.239	29.487	27.01	1.15

The mean BMI before trail was 27.59 with S. D of 1.16 and after trail the mean weight decreased to 27.01 with S. D of 1.15.

Table 5 Change in BMI: Group B

BMI	Minimum	Maximum	Mean	SD
BT	25.69	28.27	26.61	0.63
AT	25.016	27.426	26.16	0.64

The mean BMI before trail was 26.61 with S. D of 0.63 and after trail the mean BMI decreased to 26.16 with S. D of 0.64

Table 6 Change in BMI between two groups

Intervention	N	MD	SD	t	Sig.
Yoga	30	-0.45107	0.19	2.02040	0.04797*
Yoga & pranayama	30	-0.58073	0.29		

Two tailed t test, $\alpha=0.05$, *Significant at 95% confidence interval

The change in mean value of BMI before and after trail in group doing yoga was -0.45107 with SD 0.19, and in the group doing pranayama with yoga was -0.58073 with SD 0.29. In group doing yoga and group with yoga and pranayama the BMI decreased. By conventional criteria the difference in BMI considered to be statistically significant with the p value 0.04797* which is less than 0.05.

Table 7 Change in Respiratory rate between two groups

Intervention	N	MD	SD	t	Sig.
Yoga	30	-0.43333	0.50	-2.09093	0.04093*
Yoga & pranayama	30	0.1100	1.01		

Two tailed t test, $\alpha=0.05$, *Significant at 95% confidence interval

Table 8 Change in Systolic pressure between two groups

Intervention	N	MD	SD	t	Sig.
Yoga	30	1.00000	2.95	0.45540	0.65052
Yoga & pranayama	30	1.40000	3.79		

Two tailed t test, $\alpha=0.05$, *Significant at 95% confidence interval**Table 9** Change in Diastolic pressure between two groups

Intervention	N	MD	SD	t	Sig.
Yoga	30	-1.06667	1.14	0.59199	0.55616
Yoga & pranayama	30	-1.33333	2.18		

Two tailed t test, $\alpha=0.05$, *Significant at 95% confidence interval

4. DISCUSSION

The ancient Indian science of yoga makes use of voluntary regulation of the breathing to make respiration rhythmic and to calm the mind. Some varieties of pranayama require the practitioner to inhale and exhale through one nostril selectively. In yoga the importance of breathing through left or right has been recognized for millennia. In this study the effect of surya anuloma viloma pranayama on body mass index is assessed. Right nostril represents the pingala nadi or surya nadi, which is important for many metabolic processes.

The autonomic nervous system consists of sympathetic and para sympathetic nervous system and adrenal medulla. The autonomic nervous system is also stimulated and relaxed by the pranayama practice. The sympathetic system is stimulated by increasing the flow of breath in the right nostril. This increases the heart rate, produces more sweaty palms, dilates the pupils and opens up the lungs all part of the fight or flight reaction. The resting metabolic rate and energy expenditure is increased by the practice of surya anuloma viloma pranayama. Obesity, a major nutritional disorder in the industrialized and 'industrializing' world, is considered to be a disorder of energy balance. A world-wide trend towards positive energy balance is primarily due to reduced energy expenditure, lowering levels of physical work and increased dietary caloric intake. All this will lead to weight gain along with genetic predisposition. Variations in the autonomic nervous system have been suggested to be of importance in the formation of obesity. Based on several studies in animal models of obesity, the sympathoadrenal system has commonly been assumed to have a determining role in obesity development, through its influence on regulation of energy expenditure.

An earlier hypothesis postulates that sympathetic under activity, by reducing thermogenesis, might lead to weight gain and obesity (Eikelis and Esler, 2005) with some experimental observations supporting this hypothesis. One example put forward by surgical removal of the ventromedial hypothalamus in rodents, in which obesity occurs due to increased appetite. Normally the hunger and satiety are controlled by higher brain centers especially hypothalamus. Any lesion in the hypothalamus and related centers will lead either obesity or emaciation (Brobeck, 1946). The ida nadi functions include the spatial, artistic, holistic and psychic side of perception and a study on forced right nostril breathing occluding the left nostril was found to increase blood glucose levels. Pingala nadi is responsible for the logical, rational and analytical faculties. The alternating rhythm of the nasal cycle is necessary for maintaining balance between the ida nadi and pingala nadi functions. Stimulation of pingala is extroverting in nature and increase the basal metabolic rate and heart rate.

The main aspects of sympathetic nervous system function which are specific interest in relation to metabolism and obesity. Sympathetic stimulation has multiple metabolic effects such as release of glucose from the liver, increase in blood glucose concentration, increase in glycogenolysis in both liver and muscle, increase in basal metabolic rate and energy expenditure. Stimulation of the sympathetic nerves to the adrenal medullae Causes the production of large quantities of epinephrine and nor epinephrine. Then it will be released in to the circulating blood. The circulating norepinephrine has an effect on blood vessels and causes the constriction of all the blood vessels of the body, increased activity of the heart, inhibition of the gastro intestinal tract. The SNS has a major role in the control of lipolysis in adipose tissue both directly and due to effects on pancreatic hormone secretion.

The habitual SNS activity may also play variability in weight loss during the treatment of obesity. In rodents' administration of the adipocyte hormone leptin promotes negative energy balance. Animals with defective leptin synthesis or receptor function have markedly reduced SNS activity and development of obesity. Rodents made obese by lesions in the ventromedial hypothalamus, have reduced firing rate of sympathetic nerves. In a study conducted in human, clearly explains the relation between sympathetic activity and obesity, in which less urinary nor adrenaline excretion develops overweight and less urinary adrenaline excretion causes central obesity (Snitker et al., 2000).

5. CONCLUSION

Worldwide acceptance of yoga is increasing in the present era. People are more aware of the yogic culture. Among the Astanga yoga asana and pranayama are more generous. For the restless mind it gives solace. For the sick it is a boon. For the common man it is the fashion of the day to keep himself fit and beautiful. Obesity is a common but serious health problem in the present scenario. We already know that by doing yoga asanas the body weight can be reduced. But in this study, we are analysing the effect of a special pranayama technique called surya anuloma viloma pranayama on body mass index. The surya anuloma viloma pranayama is a special type of pranayama in which inhalation and exhalation occurs only through the right nostril and stimulates the sympathetic activity of the body.

Activation of sympathetic nervous system has multiple metabolic effects such as release of glucose from the liver, increase in blood glucose concentration, increase in glycogenolysis in both liver and muscle, increase in basal metabolic rate and energy expenditure. Stimulation of the sympathetic nerves to the adrenal medullae causes large quantities of epinephrine and nor epinephrine to be released in to the circulating blood. The circulating nor epinephrine causes constriction of all the blood vessels of the body, increased activity of the heart, inhibition of the gastro intestinal tract. The SNS has a major role in the control of lipolysis in adipose tissue both directly and due to effects on pancreatic hormone secretion.

Following are the changes seen after the intervention

In Pulse Rate:

In both groups the pulse rate after intervention is increased within normal limits. But the change is not significant statistically with p value 0.05572.

In Respiratory Rate:

In group B, the respiratory rate decreased and in group A respiratory rate increased in normal physiological limits. The change is statistically significant with p value 0.04093

In systolic pressure:

In both group A and B, the systolic pressure increased. The change is not statistically significant with p value 0.65052.

In Diastolic Pressure:

In group A and in group B the diastolic pressure decreased, because peripheral resistance decreased by both practice

In Body weight:

Both in group A and B, weight decreased. But the weight decreased more in the group A than in B. Only by yogasana the weight reduced, because asana is a type of exercise. Exercise can reduce the fat mass. Along with this, by doing surya anuloma viloma pranayama the weight reduced more. Sympathetic stimulation increases the production of adrenaline and as a result of sympathetic stimulation in pranayama the formation of these adreno medullary secretions increases and these two hormones directly activate hormone-sensitive triglyceride lipase, which is present in abundance in the fat cells and this causes rapid breakdown of triglycerides and mobilization of fatty acids (Guyton and Hall, 2006) and increased the beta oxidation in turn increased the basal metabolic rate. So, the weight change is more in group A due to lipolysis.

In Body Mass Index:

In group A and B, the BMI decreased. More BMI reduced in group A, i.e., More weight reduced while doing surya anuloma viloma pranayama along with yoga. Increased sympathetic tone will increase the metabolic rate. Since the BMI is a ratio between the weight and square of height, reduction in the weight automatically decreases the BMI. By conventional criteria the difference is considered to be statistically significant with the P value 0.04797 which is less than 0.05.

Limitation

The study period was limited to 30 days, so prolonged effect of the therapies could not be assessed in the present study. The BMI machine was not used for the study. Overweight individuals with normal lipid profile only were selected for the study.

Acknowledgement

I convey my sincere thanks to all the participants who involved in this study.

Ethical clearance

The research topic and the assessment of proforma were placed before the ethical committee of Govt. Ayurveda College, Kannur. The study started only after obtaining the ethical clearance certificate (E2-3975/10/ACK).

Informed consent

Written consent was obtained from the participants.

Ethical approval

Not applicable.

Conflicts of interests

The authors declare that there are no conflicts of interests.

Funding

The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

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